



GOVERNMENT OF INDIA
ARCHÆOLOGICAL SURVEY OF INDIA

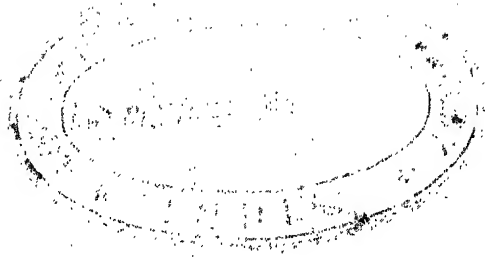
ARCHÆOLOGICAL
LIBRARY

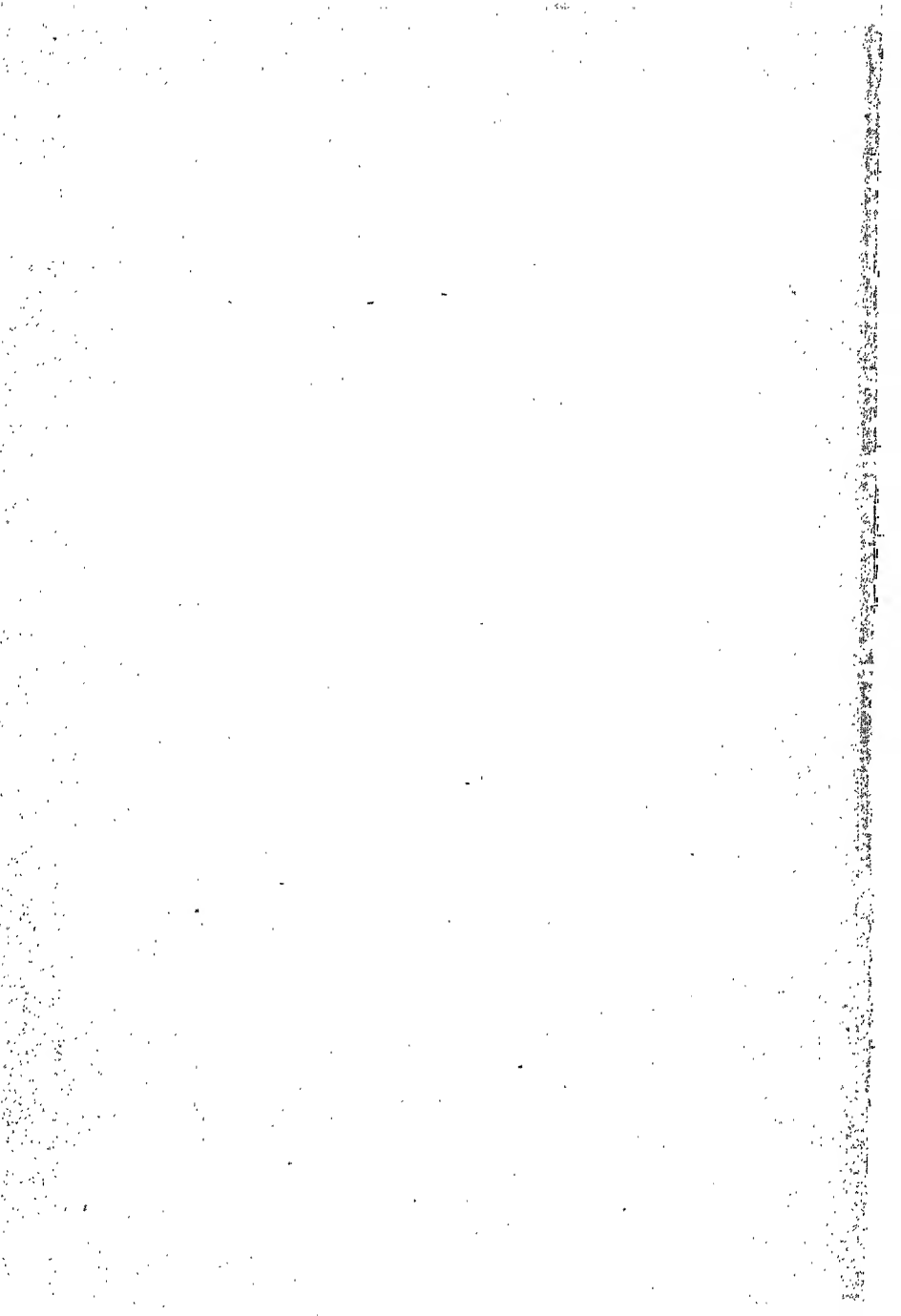
ACCESSION NO. 20020

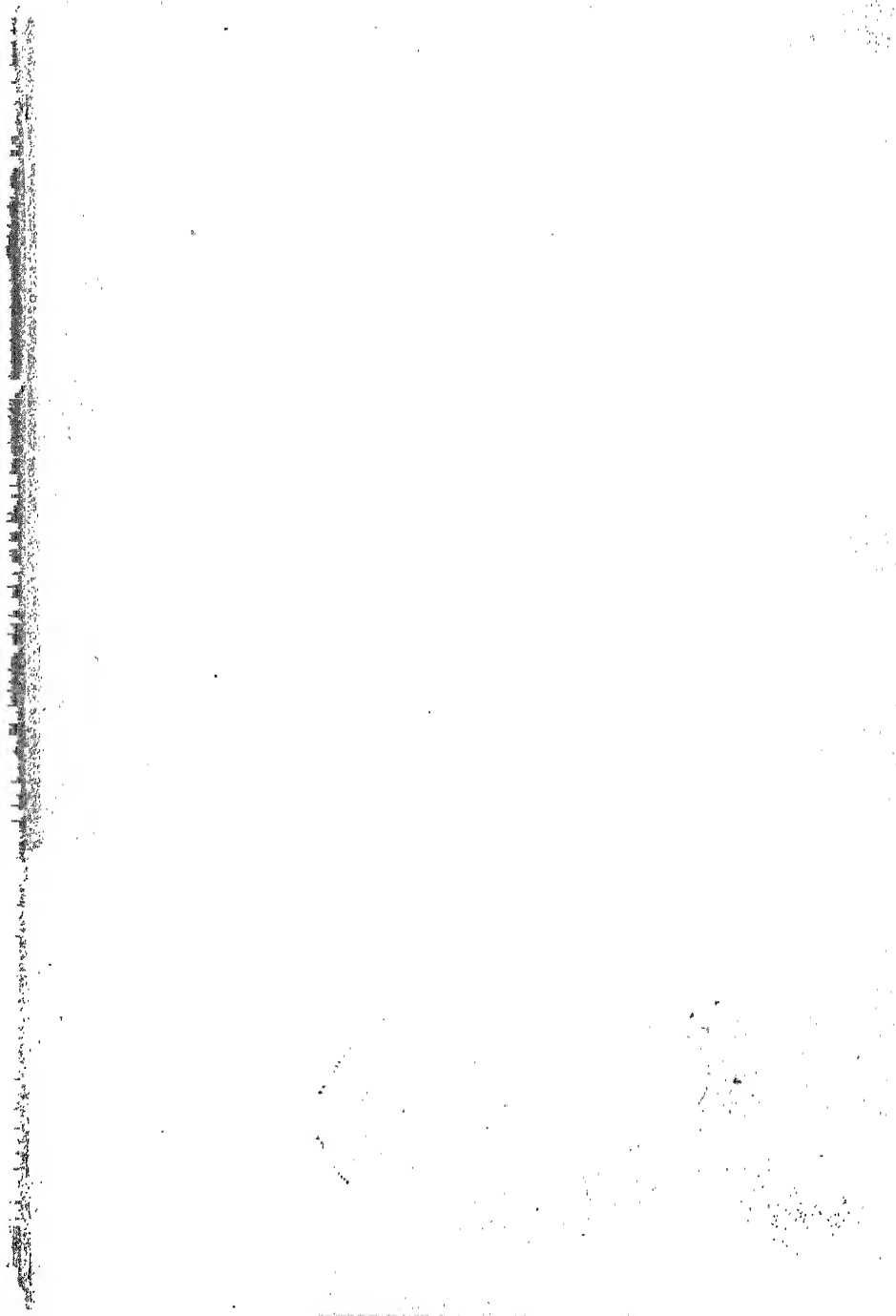
CALL No. 913.09/S.P.A.B.

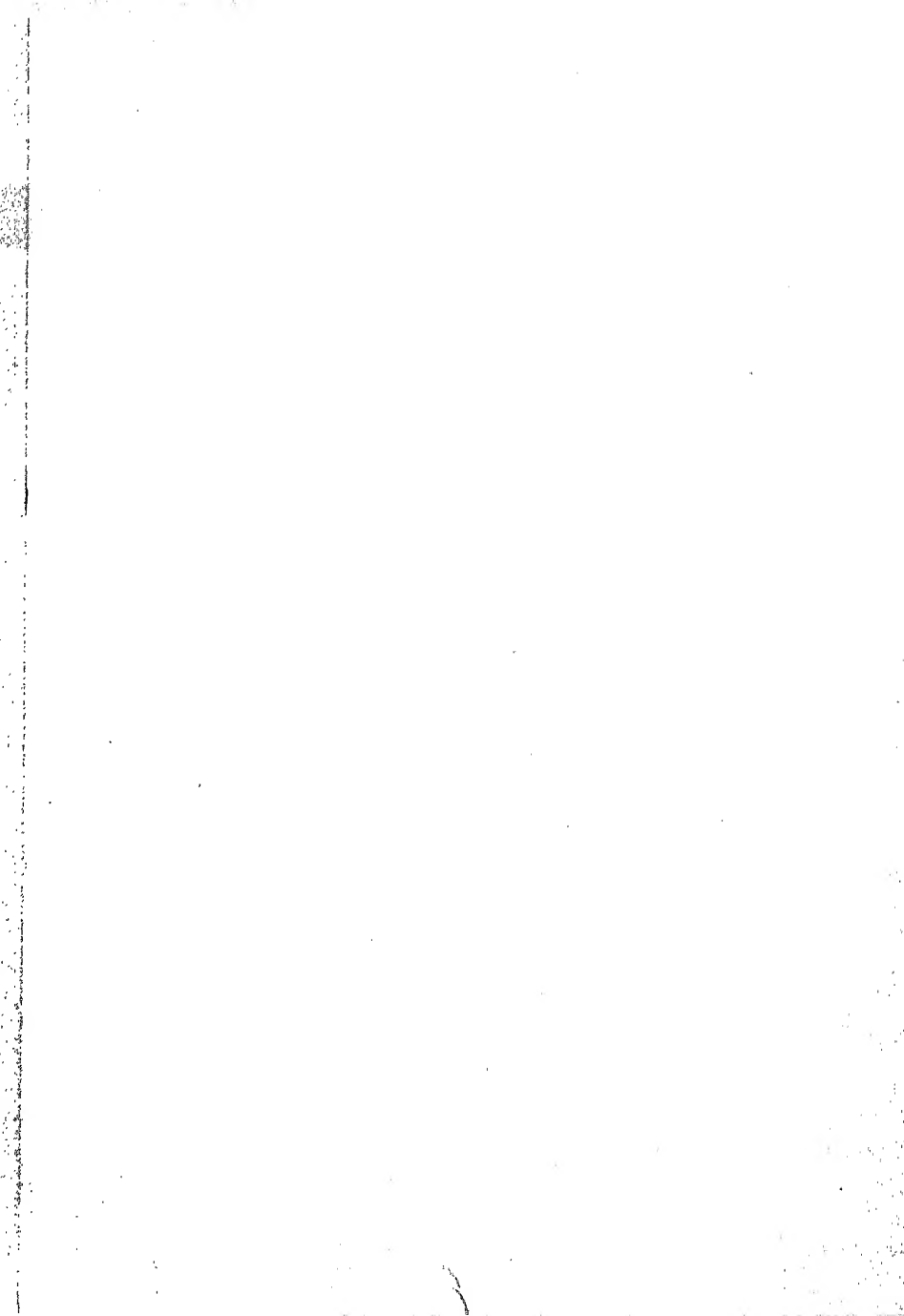
D.G.A. 79.

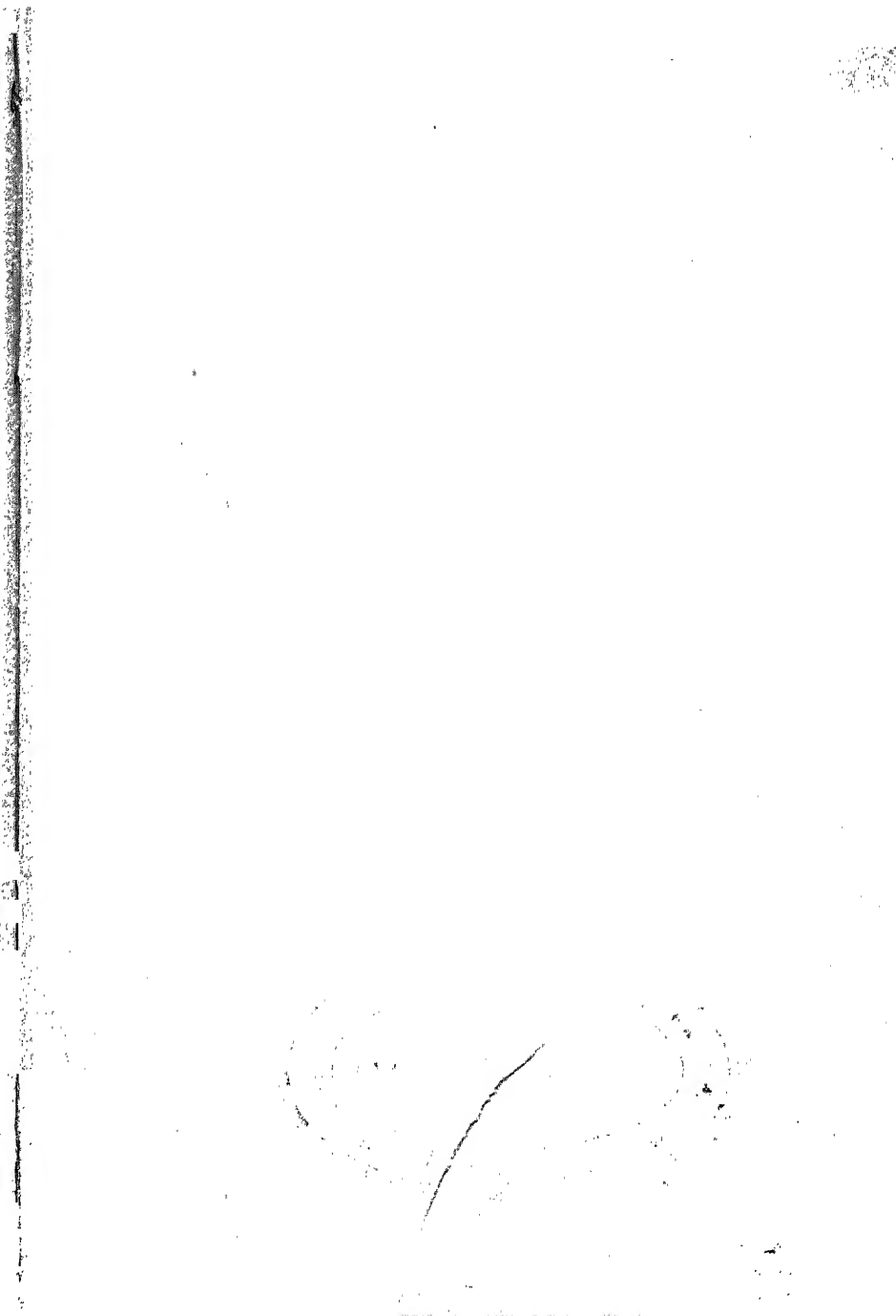
~~11~~ 6/12/21











A L 33

NOTES ON THE REPAIR OF ANCIENT BUILDINGS

ISSUED BY THE SOCIETY FOR
THE PROTECTION OF ANCIENT
BUILDINGS

25920

913.09

~~B10~~

LONDON: Published by the Committee,
and sold on their behalf by B. T. Batsford, 94
High Holborn. February 1903.

CENTRAL ARCHAEOLOGICAL
LIBRARY, NEW DELHI.

Acc. No. 20020.

Date 17. 2. 55.

Call No. 913.09/S.P.A.B.

CONTENTS

Introduction	Page 9
Notes on the Repair of Buildings :	
Preface	20
Supervision	21
Masonry	26
Roofs	46
Windows	52
Surface Drains	55
Floors	56
Heating	57
Wall Coverings	58
Galleries	62
Organ-Chambers and Vestries	62
Additions to Ancient Buildings	63
Wall Paintings	64
Fittings	66
Bells and Bell-Cages	67
Decoration	69
Monuments and Brasses	69
Ivy	70
Ironwork	70
Timber Buildings	70
Repair of Ruins	71
Appendix. Statement of Principles of the Society	72

INTRODUCTION

Those into whose hands this book comes, may be the better able to understand the principles upon which the proper treatment of ancient buildings rests, if we begin by giving a short summary of the history of the churches in England during the past hundred years. It was towards the end of the eighteenth century that a renewal of interest took place in the forms and spirit of mediaeval architecture. But this movement did not assume definite shape till some fifty years later, when it was much strengthened by the great ecclesiastical revival which, primarily one dealing with religious theory, soon turned to the more practical side and began to concern itself with the externals of religion ; and hereby the actual fabrics of our ancient churches were for the first time materially affected. The aesthetics of public worship were revolutionised ; mediaeval usage became the recognised standard of taste ; and as an effect of this, the study of the art and architecture of the middle ages was not only largely increased, but also lost much of the character of dilettantism it had possessed as long as no practical result was expected from it. Placed on a more scientific basis by architects, it also spread among the clergy and the educated classes of the community in ever widening circles, until an interest in Gothic art became a popular form of refined enjoyment. In the year 1846, the Ecclesiological Society was formed out of the Cambridge Camden Society ; it had as its objects the study of all matters

Historical
retro-
spect.

The
Gothic
revival.

relating to church architecture, ritual, music, wall-paintings, and in short, whatever might be held to contribute to the greater dignity and beauty of churches. Other archaeological societies with kindred aims were founded in many places, and their influence rapidly spread and gathered strength.

The early
restorers.

The interest in mediaeval art was thus brought out of the theoretic stage. At that time the state of our churches, speaking generally, was one of dilapidation and decay to an even greater extent than in buildings devoted to secular uses. The religious revival naturally brought with it a desire to rescue the churches from their lamentable condition, and to bring them back to what was called their pristine beauty. The utmost enthusiasm was thrown into the work, and if this had been properly directed, no doubt the result of the movement would have been to increase the value of ancient buildings. But unfortunately the wish to make the buildings perfect, the desire to have everything complete, gave rise to the craze for restoration so called, the effect of which has been to make many ancient buildings which once were full of vitality and interest mere modern copies, which, whether as works of art or as records of the past, are of little value.

The motive of the first restorers was excellent, but they acted on the false belief that modern work made in imitation of ancient work could take the place of the old without any loss of authenticity or interest as a historical or artistic document. The knowledge they had gained by study

INTRODUCTION

they supplemented with theories and prejudices which, if they had gone more deeply into the matter, would have been found to be mistaken. For instance, they asserted that plaster and white-wash were unknown before churchwarden days, whereas a closer investigation would have made it plain to them that our ancient buildings have from the earliest times been finished with stucco or plaster, which was generally whitened. A cause of considerable destruction was the preference shown by the restorers for one mediaeval style over another. They removed much valuable work in order that it might be replaced by conjectural imitative work, to make (as they said) the buildings complete in one style. It is hardly necessary to say that the result of such practices has been disastrous, and even those who oppose the principles of the Society for the Protection of Ancient Buildings admit that irremediable harm has been done.

But it may be asked, What are the points of difference between those who wish for the restoration of our ancient buildings and those who oppose the process? We answer in this way: The restorer professes to be able to bring an ancient building back to its original condition and appearance by faithfully and minutely reproducing all that has been lost or destroyed, and by making the new work resemble the old as nearly as possible. Now we know that the result of putting this doctrine into effect has been to rob the majority of our ancient churches of their true expression, and

Restoration versus repair.

to make some of them caricatures of the old inspiration. They resemble pictures which have been re-painted and improved until the beautiful evidences of age and the power of the master's hand have been almost obliterated.

Why
restora-
tion is im-
possible,

But no great knowledge of art is needed to perceive that personal qualities and influences were the essence of the ancient work ; that therein consisted that which made it art. But inasmuch as these qualities and influences cannot be revived, so what they produced can never be re-made. The conditions and surroundings of every period are different, so that the motives which act on men of one age cannot govern the production of genuine work conceived in the spirit and embodied in the forms of another.

The work done in the Middle Ages was thoroughly the work of artists, although the workers were unconscious of the existence of Art according to the modern meaning of the word. In those days the men who executed the work understood what they were doing, whereas now the architect makes detailed drawings which the workman follows blindly, not knowing whether his work be beautiful or ugly ; and it must be remembered that the workman of to-day has the aid of machinery, and the very tools he uses differ from those employed by the old builders. Again, one of the charms of mediaeval architecture is that no two buildings are alike ; for when we come to study the details we find that variety exists even where

INTRODUCTION

the features appear at first sight to be exact counterparts one of another.

Therefore those who oppose restoration say that it is impossible to reproduce ancient work even if it were desirable to do so ; and they maintain that the only way in which we can truthfully restore is by putting back in its original position any actual object which has been found to be out of place.

Even were it possible to reproduce lost work, it may be said that in matters artistic honesty is the best policy, just as much as in other affairs of life. The restorer is in reality committing a forgery, and if he succeeds in deceiving, and makes people believe that his new work is ancient work, he falsifies a historical record ; if on the other hand he is unsuccessful, and it can be seen that the old work has been tampered with, he raises a doubt as to the authenticity of the genuine work. Again, the effect on the producers of these forgeries must not be overlooked. It is artistically demoralising both to the designer and to the workman to be making slavish copies, when there is no hope that they can surpass their model, but on the contrary a certainty that their copy must be inferior to the original.

A favourite argument of the restorers when they wish to carry out alterations to ancient buildings is that the old builders did not hesitate to destroy and alter the work of their predecessors, and therefore they are justified in following the same course. But this plea is untenable, because

and not
honest if
it be
possible.

Living
styles and
dead.

REPAIR OF ANCIENT BUILDINGS

there is no sort of parallel between the modern restorer and the mediaeval builder who altered the work of his predecessors. We all know that from early days constant alterations in, or additions to, the fabrics of churches were made, but in such cases whatever was done was executed in the style prevailing at the time, and not in imitation of any former style. They destroyed work which probably we should have wished them to retain, but at any rate they put in its place work which has the essential qualities possessed by every true work of art; and it is to a large extent their additions and alterations which make these buildings so historically valuable as showing the growth of the various styles. The restorer can at best only hope to add to a building, or to put in the place of the work he destroys a more or less conjectural copy in one of these styles of architecture; and the result, both as a work of art and as a record of the past, must of necessity be without value.

The
principles
of our
Society.

The Society for the Protection of Ancient Buildings was founded in 1877 to oppose this process of so-called restoration, and to urge that protection should take its place. Its principles were briefly these. It is generally admitted that our ancient buildings are a source of pleasure and interest to all who have any sort of care for history and art. There are few memorials which so greatly tempt the student to inquire into the past as the buildings which the past has left to us.

INTRODUCTION

Through them we discover the habits and customs, as well as the religious and artistic emotions of their builders, of which we should otherwise have but imperfect knowledge; and thus in destroying such buildings we destroy valuable records. It may be said that very few people favour the destruction of ancient buildings, and this is probably the case; but the works which have been carried out under the name of restoration have resulted in large numbers of ancient buildings losing so much of their authentic character that they have ceased to be the work of the mediaeval builders, and have become mere copies, which, from the artistic and historical points of view, are less valuable than the average new building erected in the present day.

The Society from its first foundation, as will be seen from the statement of its principles issued by it and reprinted as an appendix to this book, urged that repair should take the place of restoration, that decay should be arrested by continual care, and generally that these buildings should be reverently treated as the priceless records of the past, which should not be interfered with or altered if the necessities of the present day could possibly be met in any other way. This statement was compiled by the founders of the Society, and in spite of the additional knowledge which the experience of twenty-five years has gained for us it still holds its place unaltered, and still governs the action of the Committee.

REPAIR OF ANCIENT BUILDINGS

Plea for
rever-
ence in
handling
old work.

The Society pleaded then as it pleads now that our ancient churches should not be merely regarded as antiquarian repositories, or as note-books for the artist and architect, but as our most valuable links with the past, placing us hand in hand with our forefathers, so that seeing what they achieved amid so much difficulty and discouragement, we may be impelled not slavishly to copy their work, but to re-create the spirit which enabled them to produce it. It must be remembered that our ancient architecture is absolutely limited in quantity, and that by no expenditure of money and skill can we increase or replace it. What remains to us ought therefore to be preserved with the most anxious care. The Society, with a view to attaining this end, has always urged that ancient buildings should be used, and in the cases of ancient churches that they should be made fit for the purpose for which they were primarily built. Works of preservation must of course be undertaken; but experience has shown that the operations of a modern builder almost always detract from the beauty and interest of an ancient building. They should therefore be most carefully restricted; and much work which might be considered advisable if the building were modern, cannot be even thought of in dealing with old churches.

Charges
brought
against the
Society.

In the early days of the Society its opponents alleged that it was a Society for protecting ancient buildings by allowing them to tumble down. How unjustifiable this statement was can be gathered

INTRODUCTION

by any unprejudiced person who will read the leaflets and papers which have been published by the Society from time to time. At various dates other equally unfounded charges have been brought against the Society. One of the latest of these is that it does not take enough into account the fact that churches are for use in the first place and for ornament in the second. Now those acquainted with the working of the Society know how entirely unfounded this charge is ; for the Society is always urging that ancient buildings are more likely to be preserved if they are put to some use, and in the case of churches, it is continually pointing out how they can be rendered fit for worship, while at the same time retaining their authentic character as genuine works of art and records of the past. It is undoubtedly true that the Society is always opposed to elaborate alterations or additions to ancient buildings ; and as a result of this position, those who favour such schemes always assert that the changes they propose are in each case necessary for the proper conduct of public worship. This is manifestly incorrect ; and indeed, as a rule, the object of such proposals is merely to meet some passing fashion in ritual.

The Society holds that these works of the Modern mediaeval builders should not be tampered with work for such a purpose, but where modern work is must be essential, that it should be simple and unpretentious, of good material and workmanship, and frankly modern, frankly the production of the present day. Modern

Enlarge-
ment
or new
churches.

work attached to an ancient building, if done simply and directly, without attempting to copy any particular style, is far less injurious to the expression of the structure than any more learned and self-asserting efforts to imitate the styles exemplified in the ancient work which has descended to the present day. The question of the enlargement or alteration of an ancient building is one requiring the most careful consideration before a decision is come to ; for in many cases the object in view can be attained in some other way. Let us take the example of a village which has just had a railway brought to it, with the consequence that its population is rapidly increasing. A proposal is made to enlarge the church in order to provide additional accommodation. This is done, but after a few years it is found that the church is again too small, and another enlargement is necessary. This goes on from time to time, until there is hardly a portion of the old church remaining ; and then after all a new church may have to be built. In such cases it would be far wiser to face the needs of the case from the beginning by building a second church, and to repair and retain the ancient one uninjured ; for while a new church can be designed so that it may be built in sections, every addition to the old church must result in a corresponding loss of interest, and more money will probably be spent from first to last in tampering with the old church than would have been needed to build a new one.

INTRODUCTION

The Society is continually being informed by the custodians of ancient buildings when it applies for information about proposed works of restoration, that all the interesting features will be preserved ; but there are many ancient buildings of singular beauty which possess none of the features which are often supposed to constitute the principal claims of an old building to our attention. Such features, like the eyes in a human face, are no doubt the centre of interest, but it is as part of the main structure that they interest us ; and but for their connexion with roof and walls of pleasant colour and materials, bearing the evidence of many vicissitudes upon them, their appeal to us would be far less moving. Accordingly we should remember that if we wish to retain in our ancient buildings the indescribable charm which every genuine work of art possesses, it is essential to preserve not only their more elaborate and ornamental details, but also the simpler portions, such as plain wall surfaces, clear glass, plain stone or tile paving, rough-cast and the like : we are in fact bound to treat them as essential parts of those priceless possessions, the beauty of which we cannot hope to increase, but may by a moment's heedlessness or blindness irreparably injure or destroy.

The building to be looked at as an artistic whole.

NOTES ON THE REPAIR OF BUILDINGS

PREFACE

The custodians of our ancient buildings are often at a loss to know what course to adopt when the buildings of which they are the guardians are in need of attention. Many desire that nothing more should be done than will make the buildings structurally sound and fit for the use to which they are devoted ; and with this object in view they consult architects who are reputed to treat ancient buildings in a conservative manner. Not unnaturally they consider that having procured what they believe to be the best advice, their only remaining duty is to raise the necessary funds to carry out the architect's recommendations. Yet in this way many ancient churches and other buildings have been deprived of their value as works of art and historical records, not because their custodians did not value them as such, but because they relied upon the advice of one person.

The following hints, founded upon the practical experience of the Society, are therefore given with the view of enabling those who have not studied the question fully to appreciate the difference between restoration and repair, between necessary and unnecessary works, good and bad materials, and so on. They are based on general principles, but of course each particular case must be judged according to circumstances, for there are hardly two ancient buildings which require exactly the same treatment. The methods recommended are

SUPERVISION

those matured by the Society during the twenty-five years of its existence.

SUPERVISION

One of the most important points in carrying out works of repair to ancient buildings is that of supervision. There has of late years been an increasing perception among architects that the ordinary Clerk of Works is not the best possible director for work on ancient buildings. This feeling has resulted in some of the younger architects with a natural turn for construction undertaking the personal direction of works on the spot in conjunction with the Society; and it has proved a most satisfactory arrangement.

Workmen of the present day cannot be expected to understand the artistic and historical value of such buildings, and if not properly directed, they either lose time by being uncertain as to what to do, or they unintentionally destroy valuable work. If, however, the work is carried out under the personal direction of the architect on the spot, the work is well done with the least possible loss of interest to the buildings, and at less cost than would be incurred if the ordinary methods of carrying out the restoration were adopted; for only the actual material, workmanship, and supervision have to be paid for. Moreover, although a general scheme for repairing a building may be devised before the work is put in hand, yet when the work is opened up unexpected contingencies

REPAIR OF ANCIENT BUILDINGS

are certain to arise, and these require to be met on the spot as they occur.

In cases where the arrangements recommended by the Society are made, the architect employed gives estimates of the probable cost of each section of the work ; he engages the workmen, and orders the necessary materials on behalf of the employers, who thus have an opportunity of seeing how the money is expended as the works proceed. The architect is paid by time and not by percentage on the money expended.

Impos-
sible to
repair by
contract.

The repair of ancient buildings cannot be properly carried out under a contract, for such a contract is signed before the works begin, and those who sign it must be still in ignorance of the exact nature of the work to be done. The cost is almost certain to be either over-estimated, in which case the custodians are compelled to pay more than they need have done ; or it is under-estimated to the builder's own loss, and this has caused the work in many cases to be scamped. Even when a contract has been entered into, unforeseen work may be found necessary which the builder can show was not in his contract ; and the custodians are not, as they generally suppose, protected from the additional cost of such work by having a contract.

Illustra-
tions of
this
method.

The two diagrams (Fig. I. and II.) which follow are intended to show how a secular building which was in danger of falling was successfully dealt with and made absolutely secure, and to illustrate the importance of personal supervision

in dealing with unexpected contingencies. It will be noticed that the beam bedded in the wall at the floor level, as shown in the section, originally gave support to the inner half of the wall, and as it was completely decayed there was danger of the wall breaking at this point, and indeed this movement was actually going on. The work which was carried out arrested the movement and relieved the ancient front from unnecessary weight and thrust.

The following are some of the buildings repaired under the personal direction of an architect on the spot in consultation with this Society :—

Some buildings so repaired.

Clare Church Tower, Suffolk.

Eglwys Brewis, Glamorganshire.

Eglwys Cummin, Carmarthenshire.

Exeter Guildhall.

Knoyle Church Tower, Wiltshire.

Lake House, Salisbury, Wiltshire.

Navestock Church, Essex.

North Stoke Church, Oxfordshire.

Sandon Church, Staffordshire.

Wilby Church, Norfolk.

Most people will agree with us when we say that the primary duty of those in charge of ancient buildings is to place them in proper structural repair. We have accordingly taken this part of our subject first, and have given the second position to those works intended to make the building suitable to the proper conduct of divine worship, or for any other use to which it is intended to put

Structural repair must come first.

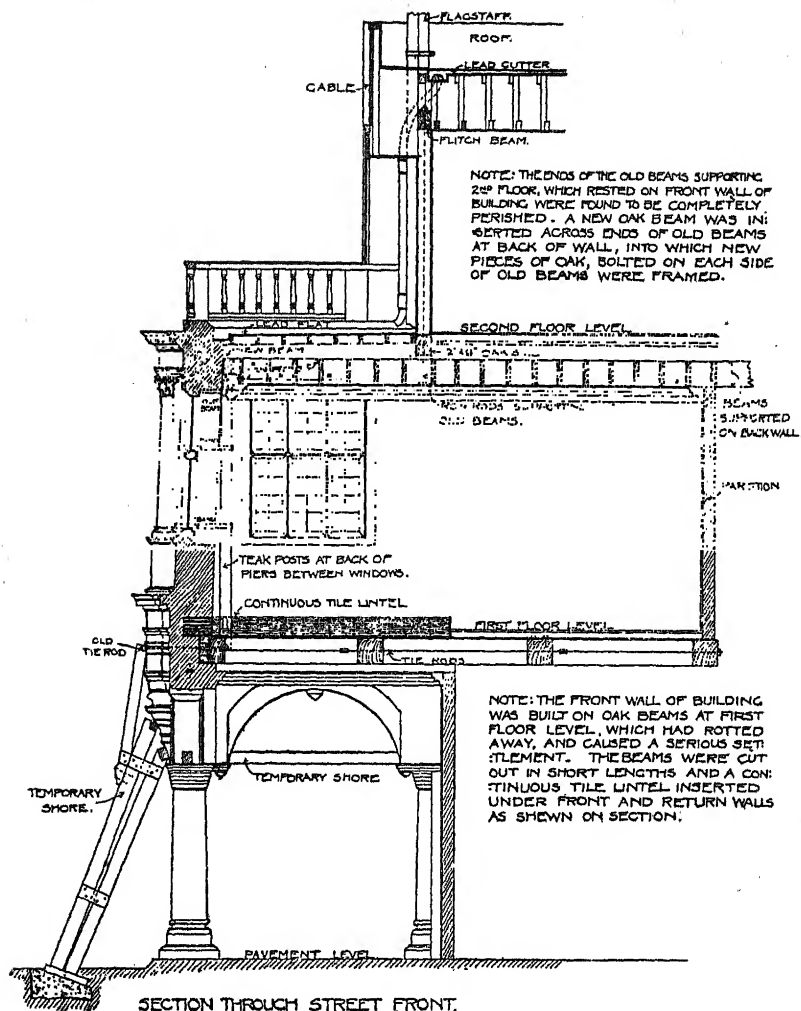
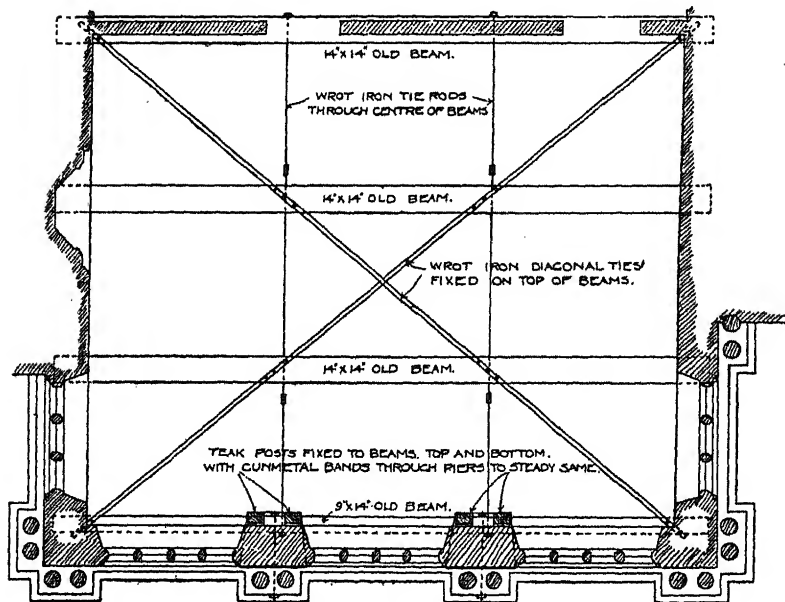
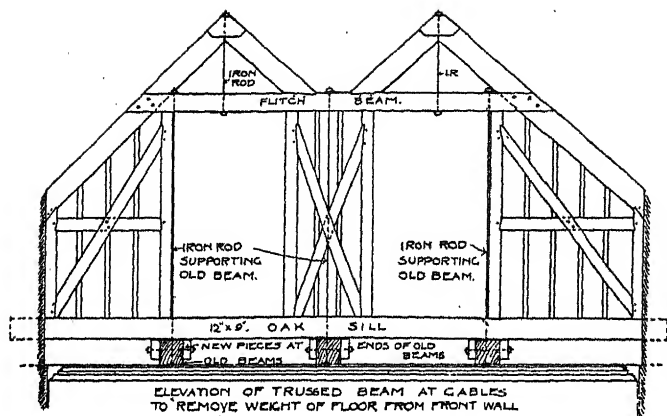


FIG. I.



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
SCALE OF FEET.

C

FIG. II.

it. Of course, we do not mean that the works should be carried out in the order here given, for each case must be judged on its own merits. For instance, in one case it may be wise to take a particular portion of a structure first, while in another this portion could be left until more pressing work has been carried out. In all cases, however, structural work should have precedence of work which is required for fitting a building for use.

MASONRY

Foundations.

In all cases where the walls show signs of weakness or cracks such as indicate a possible defect in the foundations, it is essential that the foundations should be examined, and if necessary under-pinned, or new foundations provided. Before any work on the foundations is begun, great care should be taken that properly constructed shoring and centering are provided where necessary to support the walls or arches receiving attention. This is most important.

Shoring.

Underpinning.

When many graves have been dug near the walls, inside churches as well as outside, it is no easy matter to make foundations secure. Often the only way of gaining firm ground for new foundations is to go down to the usual depth of graves, and even then the danger of disturbing adjacent foundations has to be considered. In many instances the safest course is to form a large slab of concrete near the surface of the ground, so as to spread the weight as much as

possible, and where the subsoil is clay this is generally the safest course. In a few cases the only way is to dig holes down to the solid ground at intervals of from five to ten feet, and fill them with concrete. Arches can then be thrown across from concrete pier to concrete pier to carry the wall above.

Having rendered the foundations secure, the structural condition of the superstructure should receive attention. Mediaeval walls were sometimes diminished in thickness as they were carried up, and this has led to their being condemned as being out of the perpendicular, and therefore unsafe. A wall will not fall from leaning until it is more than its own thickness out of the upright, and therefore it should not be rebuilt simply because it is to some extent out of the perpendicular. When extra support is needed, provided the foundations are sound, this can as a rule be supplied by the erection of buttresses of simple design ; for it should always be borne in mind that ancient work, if rebuilt, is no longer of any practical value to the student of art and history. Such ancient masonry does not depend merely on the design, but like any other work of art on the practical skill of the actual producer.

It often happens that an ancient wall is in a dangerous condition, owing to the decomposition and disintegration of the core of the wall, and in such cases the following method of repair will be found effective. This more particularly applies to

Walls out of the vertical.

Method of repairing walls where the core is bad.

REPAIR OF ANCIENT BUILDINGS

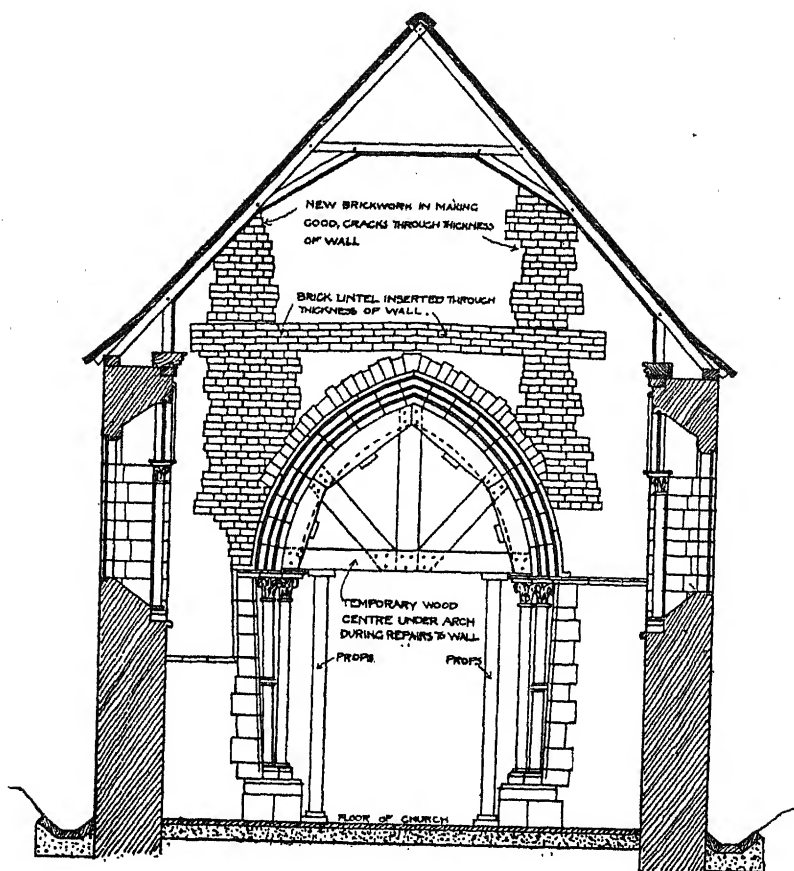
the walls of towers where the retention of the original internal face is of no great importance, but even in other cases, it is often less harmful to remove the internal plaster and repair the wall in the way recommended, than to disturb the external stonework. A hole, say, two feet or two feet six inches wide, should be made on the inside at the lowest defective part of a wall and should be taken right back to the outer facing stones. This hole should be well cleaned out with water so as to get a clean and firm surface. The bottom of the hole should then be grouted with liquid cement and sand, or lime and sand grout, to fill up all vacancies and bring the bottom to a level bed. Upon this bed build up with concrete or brick-work, as best suits the circumstances, care being taken to have a proper bond for the new work as it proceeds up the wall, and a good hold of the old work should be obtained with strong ties of Staffordshire or hard paving bricks, three or four courses deep, to the backs of the face stones. In some cases these should be bonded across the whole length of the wall inside. Thus the core and part of the back of the wall will be made perfectly secure piece by piece while the external face will only be very slightly interfered with. As a matter of fact, the method above described is really little more than continuing the common process of underbuilding upwards until the top of the wall is reached. Of course before such work is carried out the

foundations should be examined, and if necessary underbuilt; and precautions may have to be taken to prevent the running of sand from the core of the walls, and to support the work by putting centering in window openings and arches. We should mention that a method has been recently invented by which liquid cement or blue lias lime is forced into rotten walls by hydraulic pressure. So far as it has been tried we are informed that this plan has been found successful, but the Society has had no actual experience of it.

Cracks in ancient walls should be treated in like manner, but the exact mode of treatment must depend upon what is found to be necessary in each case. The annexed illustrations (Fig. III. and IV.) are given showing how, where a chancel arch had spread, the difficulty has been successfully met. We also give illustrations (Fig. V. to VIII.) showing how a church in Hertfordshire was dealt with under the auspices of the Society. The four diagrams exhibit a method adopted to arrest movement due to a restoration, by external buttresses and internal trussing. They show the leaning northward of the arcade wall, particularly at the central shaft, and the crack of the bedding in the middle shaft, which was very marked; the mischief must have been visible when the restorers were at work, for they had ruthlessly cut down the columns to get a good smooth drag and glass-paper surface. The beds were filled with fine lime putty. The dotted line through the centre of the base of

Repair of cracks.

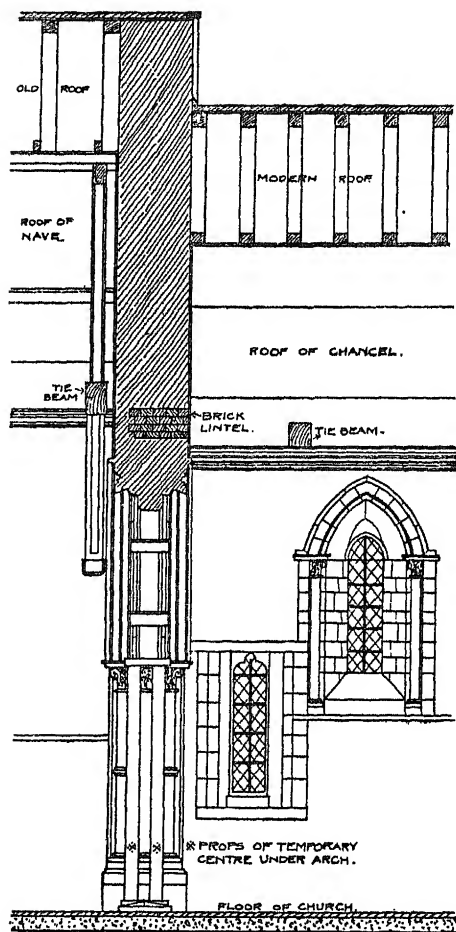
Illustrations of the repair of cracked walls.



SECTION THROUGH CHANCEL SHEWING WALL
OVER ARCH STRENGTHENED AND REPAIRED.



FIG. III.



NOTE.

WHERE NEW BRICKWORK IS SHOWN ON ELEVATION, TWO CRACKS OCCURRED THROUGH THICKNESS OF WALL OVER CHANCEL ARCH. THE CRACKS WERE CUT OUT, AND THE FLINT WALL ON EACH SIDE, WELL BONDED TOGETHER WITH HARD BRICKS.

IN ORDER TO RELIEVE THE ARCH OF SOME OF THE WEIGHT OF SUPERSTRUCTURE, A BRICK LINTEL WAS INSERTED THROUGH LENGTH, AND THICKNESS OF WALL ABOVE ARCH. WHICH ACTS AT SAME TIME AS A TIE - AND BONDS THE WALL TOGETHER.

SECTION THROUGH ARCH SHewing BRICK LINTEL INSERTED IN THICKNESS OF WALL.

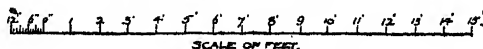


FIG. IV.

the column in Fig. VI. indicates the inclination of the arcade.

It was found during the work of repair carried out under the Society's direction, that the east wall of the aisle had been rebuilt in order to insert a new east window; this wall was too rotten to maintain, and when it was taken down there were found embedded in it a good many details of thirteenth-century masonry. Some of these were built into the new wall and exposed over the window inside the aisle. Fig. VII. shows the construction of this wall as rebuilt.

Money ran short, and the shores were left at the west end of the aisle where the wall was in a bad state, on account of the restoring architect's action in cutting away an oak tie-beam which crossed the tower arch. These shores, however, have been since removed. The core of the buttresses was built in toothed brick with cement mortar, and the rough flint facing was built at a later stage.

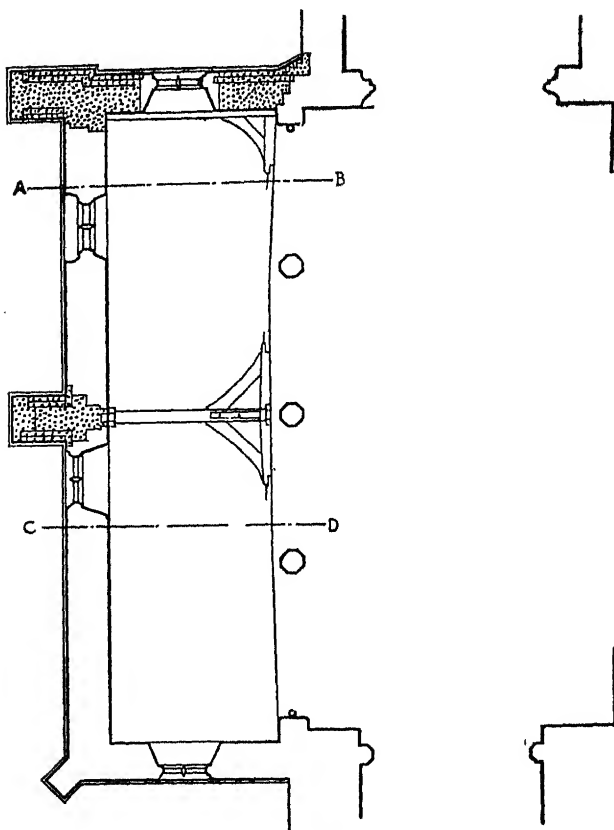
Testing
cracks.

We may mention that where cracks exist, and it is thought desirable to ascertain if movement is going on, the best method of doing so is to place plaster of Paris or cement bands across the cracks. Where the bands are put across walls covered with plaster, it is necessary to clean the plaster of whitewash and also to be sure that the plaster has a firm hold of the wall, or the test band will pull the whitewash off the plaster, or the plaster off the wall, without showing the movement which is taking place in the wall.

Nº1

A CHVRCH IN HERTFORDSHIRE

NOTE: NEW WORK SHOWN IN



PLAN

SCALE 0 5 10 15 20 FEET

FIG. V.

REPAIR OF ANCIENT BUILDINGS

Repair of
decayed
stone-
work.

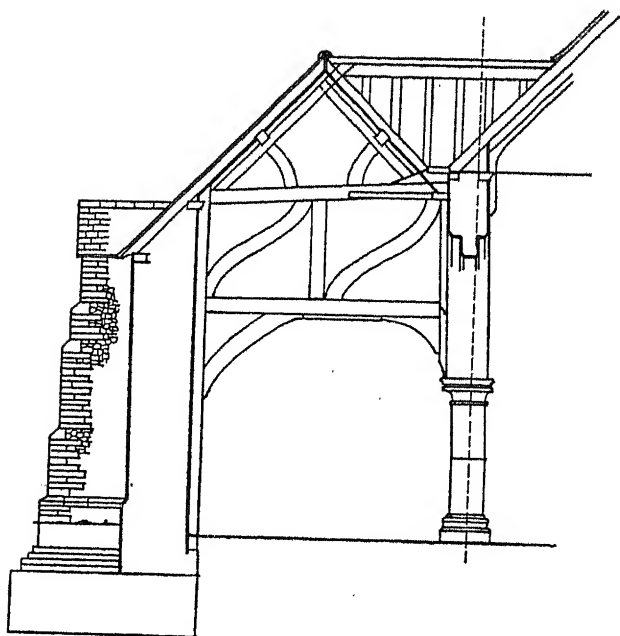
Many cases occur in which the surface stone-work of ancient buildings is badly decayed. This is especially the case in the neighbourhood of large towns. If this decayed stone be renewed the effect is that produced by an ordinary restoration, and the building loses in interest accordingly. After considerable experience the Society has come to the conclusion that if a stone is not decayed more than one-third of its thickness back into the wall, it will not endanger the safety of a building provided further decay can be stopped. The decayed surface of the stone should be cut off, the bed of the stone thoroughly cleaned out, and filled with mortar, and portions of hand-made tiles hammered in so that the straight edge of the tile comes out flush with the wall face. If the stone has only decayed a little way back it can be covered with mortar, but if it is decayed far back, layers of pieces of tile should be bedded in mortar on the tile which has been fixed in the joint, and finished off with mortar approximately flush with the wall face, some of the tile-work being allowed to show through the surface of the mortar. It will be found that after a little experience the workmen will be able with proper supervision to repair decayed mullions and tracery in the same way.

Mortar
for repair-
ing walls.

But success largely depends upon the right composition of the mortar. It is best to use blue lias lime with good clean sand, not too fine. A mixture of fine and coarse sand with a certain number of very small pebbles in it is the best.

Nº2

A CHVRCH IN HERTFORDSHIRE



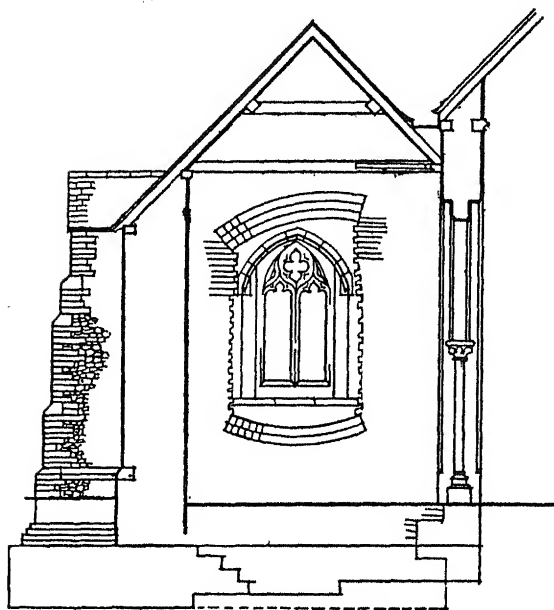
SECTION C-D

SCALE 0 5 10 15 20 FEET

FIG. VI.

Nº3.

A CHVRCH IN HERTFORDSHIRE



SECTION A-B

SCALE 0 5 10 15 20 FEET

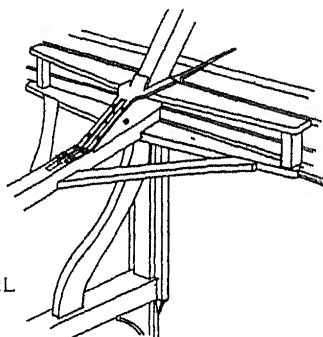
FIG. VII.

N^o4.

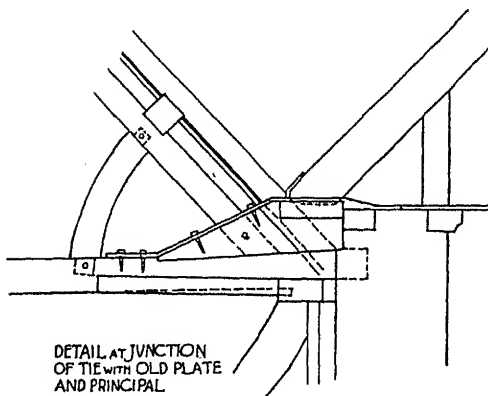
A CHVRCH IN HERTFORDSHIRE



OPPOSITE VIEW
OF SHOE AND STRAP



SKETCH of DETAIL



DETAIL AT JUNCTION
OF TIE WITH OLD PLATE
AND PRINCIPAL

SCALE A horizontal scale bar with several vertical tick marks of varying lengths, used to indicate the relative dimensions of the components in the drawing.

FIG. VIII.

The mortar should be left for two or three hours after it is made before being used, care being taken that it is well worked. No mortar should be kept over from the previous day. The first two hours of the day should be spent in preparing the stonework, and by this time the mortar will be ready for use, and fresh mortar should be mixed every two hours throughout the day. Blue lias lime is a hydraulic lime, and seldom has enough water to make it set well. Therefore a pail of water and a garden syringe should be at the side of the workman, and he should begin by repeatedly wetting the old work. In the pail should be placed broken tiles and slates to soak before use, and after his work is finished it should be kept damp for many days by the easy process of syringing it. Where possible, it is a great advantage to hang a cloth in front of the work, when finished, to keep off the frost, sun, and drying winds.

Cement
mortar.

No good building can be done with bad mortar, and yet bad mortar is not infrequently used, sometimes through ignorance, sometimes through carelessness, and sometimes through a desire for economy; but it is a false economy. Mortar may be made with cement and sand, or lime and sand. Portland cement is now the only cement used, Roman cement having practically gone out of use. When cement is used it is of the greatest importance that it should be of the best quality, and not used in too large a proportion to the

sand, otherwise it will expand and crack in setting. Good cement, when mixed with not less than three parts of good sand, does not expand enough to do harm. Expansion in such cases is generally a sign that the cement is underburnt and contains free lime. It may be fairly well tested for this fault by making up a sample, neat, with not more than one-fifth its weight in water, into pats about two and a half inches in diameter and a quarter of an inch thick at the top, using a plate of glass or porcelain for the purpose. After twenty-four hours' exposure in the air put the pat which is to be tested, with its support, in water, and if the cement cracks at the edges of the pats, or buckles, within a week, the cement is not trustworthy. Another useful test is the following. Fill a glass bottle with cement, adding enough water for it to set. The expansion of the cement should not be great enough to break the bottle.

It is advisable to spread cement out on a floor, so as to expose it to the air for ten days before use, and if it can be raked over so much the better. It is necessary that it should be carefully measured out in proportion to the sand. The sand is an important element, and this will be spoken of later. But it must be remembered that the finer the sand the greater the amount of cement needed. With good coarse sand, provided the cement is good, one part of cement to six parts of sand is probably the most that need be used, except in cases of wedging up and underpinning. Neat

cement is sometimes useful for running into cracks not wider than a sixteenth of an inch, for in such cases it is often the only possible method.

It is as a rule wiser to use lime mortar in preference to cement mortar, unless there is a necessity for the work setting quickly ; if there is no such necessity it is better for the work that it should set slowly. Nevertheless the workmen cannot be kept waiting, and therefore the builder will constantly be compelled to use cement. Where the sand can be kept fairly dry there is an excellent custom which prevails in some parts of the country, of measuring out the cement and sand (the sand, if necessary, having been previously screened), mixing them together, and then throwing the mixture through a screen before adding water.

Blue lias
lime
mortar.

There are many different blue lias limes. Some come from Wales (Aberthaw near Cardiff), some from Bridgewater, and other kinds from Leicester and elsewhere, and they vary in the time which they take to set. The best mortar is that which is slow in setting, but the drawback to slow-setting mortar is that the work must progress slowly, as the mortar must set fairly hard before it can carry the work above it. Mortar must not dry before the lime has undergone the chemical change, for if it does it will not make good mortar. The difficulty of keeping the work damp while it is setting, especially in thin walls, and the slowness of some blue lias limes in setting, render them

undesirable for mortar in many cases. But if sufficient time can be allowed, undoubtedly slow-setting blue lias limes make the best mortar, for they allow the work to get its true bearing, and they continue to harden for years. It is especially important that plenty of water should be used. Blue lias lime is sold in bags, but care is needed to see that it is genuine blue lias lime, for inferior kinds of lime called by that name have of late been in the market.

Chalk lime varies greatly in quality. In the Chalk neighbourhood of London Dorking lime can ^{lime} always be had, and it is a very good lime. It can ^{mortar.} be obtained ground in bags as well as in the lump. If a neighbourhood does not provide good lime, it is better, indeed necessary, to obtain it from a distance. It may reasonably be said that if the local builders consider that mortar is better if used stronger than in the proportion of three of sand to one of lime probably either the local lime or the local sand is unfit for use.

If sand has clay or, still worse, chalk with it, it ^{Sand.} will not be good building sand. The best sand is generally river-sand well washed, but if there is chalk present it cannot be washed out. The best sand is coarse, sharp, and free from any other matter. It is not uncommon to find sand excellent as far as cleanness and sharpness go, but too fine. It is then only necessary to obtain some coarse sand from a distance to mix with it to get an excellent result. In some cases old bricks are

cheaper than sand, and then if the works are on a large enough scale to employ a mortar-mill, first-rate mortar may be made by grinding the bricks up with lime and adding a little sand. If sand and lime are both perfect the proportions may be as low as five and one or six and one, with good results. Where a mortar-mill cannot be used, it is always wise to urge the builder, in his own interest, to use a hand-mixing mill, as it saves time and mixes the sand and lime better than it generally gets mixed by hand.

Testing
proportions.

Definite proportions cannot be given, as a variation in the quality of either ingredient involves an alteration in the relative quantities needed ; therefore the right course is to have tests made before the work is begun. Having decided on the cement and sand or lime and sand which are to be used, a man can in an hour or so build, say, four piers or blocks of brick or masonry in some shady place, graduating the proportion of lime or cement so that the first block has the largest amount of cementing material likely to be required, and the fourth block has the smallest proportion which can probably be used.

The results of the cement test can be judged of in two or three days, and even on the next day a fair opinion can be formed. After twenty-four hours or so it should resist the pressure of a finger, only leaving a slight impress, and if on the next day the blade of a knife can with moderate pressure be run into it, that is the proportion one would choose.

MASONRY

In the case of good chalk lime, it will be sufficient if it begins to set in a day or so, and is fairly hard in a week, and hard enough to carry the work above it in a fortnight. Blue lias limes differ in the length of time they take to set. Some will take a fortnight before they begin to toughen, but all blue lias limes will go on hardening for years. The less sand used, the quicker is the setting of all kinds of mortar; but the lime to be chosen is the slow-setting one which eventually sets hard. When bricks or porous stones are used the importance of soaking them with water should never be overlooked, for good work cannot be done with a material which will take the water out of the mortar. Of course wetting the building material increases the risk from frost, but then important works should not be gone on with in frosty weather.

All that has been said on the subject of mortar Concrete. applies with equal force to concrete. The lime or cement, sand, and broken stone or other core should first be well mixed together dry, and afterwards sprinkled with water through a rose. Care should be taken not to use too much water, for this leads to contraction in setting. Rather more cement or lime will be required for concrete than for building mortar. It is desirable that the stone for concrete should be broken fairly small, and the usual stipulation in specifications that the stone should be small enough to pass through a two-inch ring is not unreasonable, for if the stones

REPAIR OF ANCIENT BUILDINGS

are large, the material which binds them together, that is the mortar, is in too large masses, and becomes a source of weakness. It is an advantage if hard bricks can be broken up and mixed with the stone or flints, as the brick holds the moisture and gives it off to the cement or lime as it requires it in setting. It is an economy, where large masses of concrete are used, if larger stones be bedded in it, as it reduces the amount of cementing material needed, but they must not touch each other.

It is essential that sand should be used in concrete, unless in breaking the stone or brick sufficient grit is made to take the place of sand. Five parts of stone, three of sand, and one part of cement is probably the strongest which should ever be used. Good sharp sand is as important as good cement. Increase the cement if the sand is not sharp, and wash the sand if it is dirty. If lime is used, a larger proportion than that advised for mortar will be required, just as more cement is needed.

In using concrete for foundations it is always well to bear in mind that the more it can be spread out in width, the larger bearing surface it has on the ground and consequently (provided it be thick enough not to break with the weight put upon it), the less chance there is of a settlement. And again, blue lias lime concrete, where time can be given for it to set, is in many cases more desirable than cement concrete.

Concrete should always be well rammed immediately after being put in, and the amount of water used should be just sufficient to show on the surface when the ramming is completed. Concrete is often spoilt by too much water being used ; this results in the cement settling to the bottom, or, when the concrete is rammed, coming to the top, and so preventing any further ramming that may be needed.

The Society is, as a general rule, opposed to Reopening the opening of blocked-up arches, windows and doorways, unless they are essential for purposes of convenience or light. In many instances there were practical reasons for blocking them, and the removal of the filling in such cases may affect the stability of the superstructure.

Mosses and lichens should on no account be removed, except where they occur in the beds and joints which have to be cleaned out for pointing. It is noticeable that where lichens and mosses are growing on stone, the surface of the stone will be found to be intact ; but in our towns vegetation never adheres to the stonework.

There can be no doubt that distemping or limewashing walls safeguards them from the injurious effects of smoke and chemical fumes, which are destroying the surfaces of so many of our ancient buildings. It is therefore an excellent plan to protect them with distemper, and it will be found that if lime is slaked in boiling water (it need not be applied hot) it will adhere

very firmly, and even where stone has begun to crumble, the repeated application of it will check further decay. Experiments have recently been made with chemical preservatives, but it is impossible for the Society at the present time to speak with certainty as to their use except in particular cases.

Pointing. Where it is necessary to repoint ancient work, it is useless to do it unless the joints are raked out square for a depth at least equal to the width of the joints ; a still greater depth is often better. The joints must first be thoroughly wetted, and the mortar well pressed home. The new pointing should not be cut, ruled, raised, tucked, or treated in any other modern fashion of pointing, but should be kept absolutely flat, and flush with the wall face, the mortar for the pointing being composed of lime and clean sharp sand only, without the addition of any colouring matter such as smith's ashes and the like. Provided it can be kept wet, blue lias lime mortar is the best for the purpose.

ROOFS

Protection from rain while repairing. In carrying out repairs to roofs it is sometimes necessary to strip them, and in such cases no more of the roof should be uncovered at one time than can be protected by tarpaulins. To allow old timbers which have to be covered up before they are dried to be drenched with rain is the most certain way of starting decay in them,

and of course rain does great harm in the interior of a building.

Each timber should be examined, and repaired or renewed in oak as the case may be. No piece of sound timber should be discarded ; where only partially decayed, it can be strengthened by the use of iron straps, nuts and bolts, and where more is necessary new timbers can be spliced and scarfed on to the old. Great care is needed when examining ancient timbers, for the sap wood of oak often decays, and this sometimes leads to the belief that timbers are unsound. It will frequently be found, if a gimlet is put into such timbers, that after it has penetrated to a certain distance it stops dead, the oak being so hard that it is impossible to go further. Such timber should of course be retained. Decay easily attacks sap wood, from which it is apt to spread, and therefore where it is out of sight sap wood should be cut away. Repairing and strengthening.

Again, sometimes it will be found that wet has soaked into the back of timbers and decayed their core, but even then it is not necessary to abandon such timbers, for the decayed portion can be cut out and the space left may be turned to advantage for obtaining additional strength. The annexed diagram shows how this was done in one instance when repairing an ancient roof.

No attempt should ever be made to renew missing ornamental work. What remains is of great interest, and this interest will be diminished Renewal of ornament.

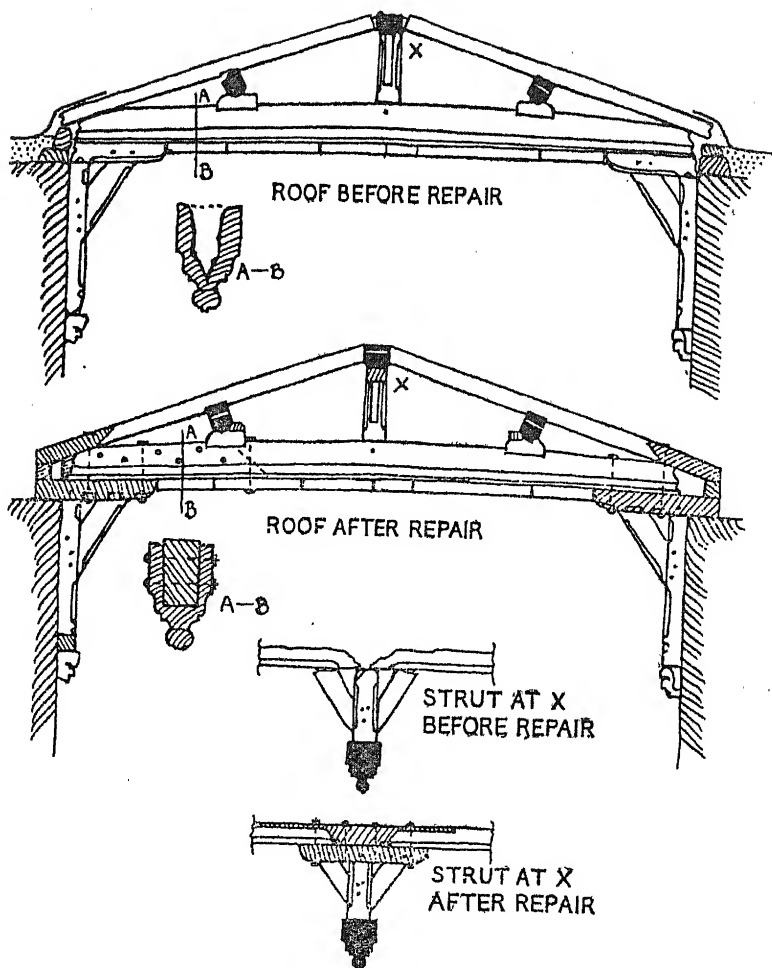


FIG. IX.

ROOFS

if new imitative work be introduced. The new ^{New} timbers should be left as they come from the ^{Timbers.} saw, and on no account should any stain, varnish, or the like, be applied either to the new or to the old work.

When roofs are covered with lead and the lead ^{Lead-} is past repair, it should be taken off and recast ^{work.} (near the site of the building if possible) to a weight of at least eight pounds per foot, any deficiency being made up with virgin pig, and it should be relaid in narrow widths of not more than two feet six inches between the rolls, and in lengths of not more than eight feet. Milled lead should never be used, for it is not only poor in appearance, but is very much less lasting than cast lead. The lead should not be laid direct upon oak boarding, but upon rough deal boarding, as the tannic acid in oak decomposes lead.

Where roofs are covered with tiles, and these ^{Tiles.} need rehanging, the tiles should be rehung with copper or zinc nails; where the holes are large, galvanised cast-iron pegs may be used. The tiles should be torched on the under side or laid upon second-crop hay, with the object of preventing snow and wind from blowing under them. Where it is not convenient to torch the tiles, the head of each tile may be bedded in mortar, but the danger in doing this is that the workmen are apt to put the mortar too far down, and then the wet soaks upwards and rots the laths. Well-burned hand-made tiles should be used to take the place

of any old tiles which cannot be reused, if old tiles cannot be obtained to make up the deficiency. Roofs covered with stone slabs, stone slates, and the like, should be treated in a similar manner.

Thatch. Roofs covered with reed or straw thatch, still to be seen in some parts of the country, should have their covering most carefully preserved, or if necessary renewed in the same material.

Unsuitable materials. The following materials should never be used for the coverings of ancient roofs:—1. Milled lead. 2. Broseley machine-made tiles, which weather badly and are brittle. 3. Thin Welsh blue slates.

The use of felt should be avoided, as its use has in many instances caused the decay of ancient roofs, and it is a cause of danger from fire. As a rule, felt is used to prevent snow from driving in and rotting the woodwork, but this can be stopped by torching, or bedding the tiles or slates with mortar. The damage caused by condensation and want of air through the use of felt is far more serious than that which would be likely to be caused by snow and rain being driven under the roof covering.

New roofs of tiebeam construction. In cases where new roofs are necessary (and it often happens that they are required to take the place of modern decayed roofs of inferior material), care should be taken that they are of good construction, for there is no justification for placing any roof on an ancient building that has not a direct tie between the walls. Otherwise when the

ROOFS

weight of the covering is put upon the roof it must spread to some extent; even if it be only a quarter of an inch, it will mean that the thrust of the roof comes upon the walls; and if they are not capable of receiving the thrust then they must crack. A roof of this description (that is, without tiebeams) on a new wall is not so objectionable, because the wall is green and will bend until the ties of the roof take the bearing, but an old wall cannot give in this way. English oak should be used for new roofs wherever possible.

When a roof has a strong projection, eaves-gutters and down-pipes are not necessary, and they should not be put, as they cannot avoid being a disfigurement; but in cases where they are essential, they are best made of lead. Rainwater heads and down-spouts can be cast or bought ready made, but a good way is to make them up on the spot out of cast sheet lead. Eaves-gutters were formerly often made V-shaped of wood; these look better than cast-iron gutters, and probably last quite as long. Eaves-gutters, down-pipes, etc.

Great care should be taken that all gutters, especially valley gutters and gutters behind parapets, are properly cleaned out from time to time, as the neglect of this has caused damage to many mediaeval buildings. Cleaning out gutters.

Many roofs are ceiled on the under side. It will depend upon the circumstances of the case whether it is advisable to remove the ceilings. If the roofs above them are in a condition to

admit of their being open to the church, there is no great harm in removing a ceiling, provided it is a modern one ; but it should be remembered that the removal of such ceilings makes the building colder in winter and hotter in summer. In the West of England the panels of the ancient barrel roofs are sometimes of plaster, and this should not be replaced by any other material. Where the plaster-work is decayed it should be renewed.

WINDOWS

Mullions
and
tracery.

Where the mullions and tracery are decayed, the decayed stonework should be cut away until sound stone is reached, the work should then be made up in the way described on page 34. Of course, a new stone here and there may be necessary, but if the work is properly superintended, few new stones will, as a rule, be needed. Even when new stones are necessary, it will generally be found that the stone from the glass line inwards is sound, so that it is only necessary to dowel on a new outer half.

Glazing.

Mediaeval stained glass should never be touched except by a skilled workman. Nothing should ever be done beyond repairing the lead-work, and this should be carried out piecemeal, and if possible without removing the glass from the windows.

Ancient glass should not be cleaned. Much glass has been spoilt by the removal of the paint, which was fired on to give the drawing.

WINDOWS

All existing clear glass should be most carefully preserved. It is nearly always crown glass, which is far more beautiful than sheet glass, as each pane is made slightly convex, so that it catches the light and gives a sparkle to the window. In many cases the surface of the glass has a delicate opalescent effect, due to decay, which adds to its beauty.

It is in most cases a misfortune when modern stained glass is introduced into an ancient building; for such glass is almost always incongruous, whatever may be the merits of the glass itself, and when once introduced, however harmful it may be to the general character of a building, it is most difficult, if not impossible, to get it removed, because as a rule it is given as a memorial. Another grave objection to stained glass is that the wire guards outside, which are always put to protect it, are a great disfigurement to the exterior of the building. Furthermore, ancient stonework is always injured when new stained glass is put into an old window. Stained glass has often been introduced where the sunlight coming through clear glass has caused inconvenience. The Society advises that light curtains of butter muslin or some such material, should be used in such cases. Drapery of this description may often add to the effect of a building, but modern stained glass is always to be regretted.

So-called cathedral or other tinted glass should also be avoided. Countless numbers of ancient

REPAIR OF ANCIENT BUILDINGS

churches have been seriously disfigured from the artistic point of view by having all the old clear glass taken out and modern cathedral glass put in its place. As a result, not only is the inside of the building spoiled, since all the windows appear to be glazed with a material looking like bad ice, but the interior is ruined by a disagreeable light being thrown upon everything, and loses much in interest when the beauties of moving foliage and sky are shut out. When it is necessary to use new glass crown glass should be used. The glazing should be pointed up with a moderately soft lime putty.

Repairs
to lead-
work.

When the leadwork is in need of repair, it should be done if possible without removing the glass, and where it is past repair, the comes of the new work should not be less than half an inch wide, and they should be left bright and not blackened. Some architects have a great fancy for ornamental leadwork, but this should never be introduced into an ancient building.

Stan-
chions
and
saddle-
bars.

The old iron stanchions and saddle-bars should always be preserved, as they steady the mullions and add considerably to the strength of the window; and it is often advisable to add new saddle-bars of gun-metal or wrought iron. The ends of iron stanchions and saddle-bars should be heated and dipped when hot into linseed oil, as this prevents the ends from rusting and splitting the stone in which they are fixed. Sulphur is found a convenient and satisfactory material to set them in.

SURFACE DRAINS

Where a building is found to be damp it is sometimes essential that a surface drain should be put round outside the external walls, but as the appearance of such drains is somewhat unsightly, they should be avoided if possible. Where the level of the ground outside a building is above the internal floor level, it should be lowered about six inches below the floor level. In cases where surface drains must be provided great care is needed, as they often sink away from the wall, and the water gets between them and the wall; then they are doing more harm than good. It is best to arrange the drain with a long slope from the wall, and a short slope up to the turf, keeping the side next the wall the higher, so that if the drain becomes blocked the water will overflow away from the building. Where the level of the churchyard is considerably above the floor level, a retaining wall on the outside of the gutter is the only way of satisfactorily dealing with the difficulty. A dry drain covered over is not thought by the Society to be satisfactory.

These drains should be formed either of stone, tile, or brick, laid upon a six-inch bed of blue lias lime concrete, with proper gulleys to take away the water. The concrete should be thicker if the ground has been disturbed. On no account should blue vitrified bricks be used, as they do much to destroy the quiet appearance of an ancient building, and owing to their having little

or no suction the mortar is apt to set apart from the bricks, and leave a space for the wet to penetrate.

FLOORS

Any existing pavement which is found in an unrestored church is certain to be more in harmony with the ancient building than any modern pavement which could be put in its place. There is no reason why old floors should be discarded because they are uneven, or because they are of a later date than the building. They can be taken up and relaid on a bed of concrete, the concrete itself being laid on a thick bed of well-rammed dry rubbish; if this is not done the cold ground will cause condensation on the pavement. Any deficiency in the paving should be made good with similar materials.

Relaying floors. Perhaps the best modern pavement which can be used is one of plain stone not set out in definite squares or diamonds. Unpolished marble and good hand-made red tiles well burnt are unobjectionable, but it is almost always necessary to get the tiles fired on purpose, or they will wear away, and the red dust will be a great nuisance.

Modern pavements. Hardly any paving can be worse than one of modern encaustic tiles, especially when they are glazed and of many colours. Therefore such tiles, as well as all polished surfaces, should be avoided.

Encaustic tiles. Boarded floors should be repaired and retained, unless there is a strong reason to the contrary,

Boarded floors.

FLOORS

but care should be taken that they are properly ventilated so as to avoid dry rot. Boards laid direct on the concrete in the same waterproof composition as is used for wood blocks, are better than wood blocks, as they look quieter; but where they are used the concrete must be finished in coke breeze, and the boards nailed to it.

HEATING

From experience the Society has found that the Gurney best mode of heating an ancient church is by a ^{stoves.} Gurney stove. These stoves are used with success in the majority of our cathedral and abbey churches, and we believe that both the initial cost and the working expenses are less than those incurred by any underground system of heating. They are certainly less disfiguring than the method ^{Under-} of warming by an underground heating apparatus, ^{ground} for the heating chamber chimneys are generally ^{appa-} unsightly, and the iron gratings form dust-traps, ^{ratus.} and are ugly and out of place. Moreover, a very large number of our ancient churches have been seriously damaged by settlements owing to the sinking of heating chambers.

With a Gurney stove most of the heat given ^{Advan-} off by the fuel is utilised, and provided it is ^{tages of} placed at the west end of the building, out of a ^{Gurney} draught, and the flue taken up through the roof, ^{stoves.} the warmest place in the building will be at the east end, for the hot air will circulate along the roof, drop at the east end, and return to the stove

along the floor. To insure good circulation, if there is a western tower open to the nave, a close-fitting floor should be laid in the ringing-chamber or belfry.

WALL COVERINGS

Ancient
plaster.

The ancient builders almost without exception covered their buildings both internally and externally with plaster, except where ashlar was employed, and even then they sometimes put on at any rate a thin coat of plaster. For example, at Waverley Abbey, which has been a ruin since the dissolution of the monasteries, such a coat of plaster still exists.

Removal
of ex-
ternal
plaster.

It is now generally acknowledged that architects have made a great mistake in having till quite lately made it a practice to remove ancient plaster from the outside of buildings, although of course it has been done in ignorance of the plaster being ancient; damp has frequently shown itself on the inside of the walls after such a removal has taken place. The ancient builders knew perfectly well that many soft stones would not stand the weather, but this they did not deem of importance, as they covered the surfaces of such stones with plaster. One of the great objections to the removal of internal plaster is that in a few years the rubble walls become dirty, and then it is not known how to clean them. A pointed wall also gets dirty far more quickly than a wall covered with plaster, because there are so many projections to catch the dirt. Numbers of beautiful

Internal
plaster.

WALL COVERINGS

wall paintings have been destroyed by the removal of plaster.

The right course to follow is to repair and ^{Repair of} renew it where necessary, for there can be no ^{plaster.} better protection to the walls. Any new plaster required should be put on in one coat, and should not be screeded, but finished off with the hand trowel, following the surface of the wall. Of course new plaster should not be placed over decaying stone or vegetable matter, for the decomposition will continue and blow the plaster off. To obtain good results with modern plaster particular care and supervision are necessary. The joints should be well raked out to give a key. It is best for external work that the lime used should be blue lias lime, but for internal work chalk lime is good enough and gives less trouble on the score of cracking. In both cases, to obtain satisfactory results it is essential that the sand used should be clean, sharp, and (most important of all) coarse. It is also essential that the wall shall be thoroughly wetted before the plaster is applied, and for external work that the new plaster should be kept damp for as long a time as possible after completion. Cloths hung over it delay the drying; but the easiest way is to keep it damp with a garden syringe. This should be done for about a fortnight. We give the following accurate ^{Plastering} description by a builder of how he carried out his ^{external} plastering on the external face of a new brick-wall. ^{faces.}

The fact that the wall was new increased the diffi-

culty on account of the absorbent nature of the new bricks ; and the reason why one coat was laid and finished shortly afterwards is that this method gives an opportunity of applying more moisture ; for if new work is wetted too quickly it will be damaged.

The lime, he says, used for the external plastering was blue lias lime obtained from Lliswerry, near Newport, Monmouth, the sand was river and sharp pit-sand, both washed. The proportions used were three parts, by measure, of river sand, two parts of pit-sand, and one part of lime, all being carefully gauged. It is necessary that the lime should be laid out in an open bin under cover to cool for a fortnight before it is used, and it must be sifted through a fine running sieve to free it from small grains of core before it is mixed. The amount of material for the day's work was mixed the night before. This is most essential. The brickwork was wetted overnight or early in the morning. In summer-time it is advisable to syringe the work well with water early in the morning as well as at night. The plaster should be laid on about half an inch thick, the piece of work to be done in one day being roughly rendered and then finished by well working it with the hand float.

Ancient
white-
wash.

It is a mistake to suppose that whitewash is necessarily modern, for there are records of its having been used in churches from the eighth century onwards, and whitewashers were employed

WALL COVERINGS

in Westminster Abbey at an early date. We have also the record in Norman times of the entire re-whitewashing of S. Albans Abbey inside and out. The mediaeval builders generally whitewashed their buildings all over inside as soon as they were finished. This is shown by the fact that consecration crosses are usually found painted on a coat of whitewash.

From the purely utilitarian point of view we believe it to be one of the best known preservatives of stone as well as the best light-giver, and doubtless the old builders knew this to be the case. From the architectural point of view nothing shows off architecture to greater advantage. Unfortunately it has been brought into disrepute because the modern trade custom of adding blue is so strong that it is difficult to overcome it, and the effect of blue in whitewash is to make it offensively white.

In cases where it is advisable to remove whitewash from stonework, the only justifiable method of doing so is by the use of a stiff brush, and if necessary warm water. Where the whitewash is harder than the stone, it should never be removed, and on no account should any metal tool or Manchester Card be used for the purpose ; if this is done the original surface of the stonework together with its tool-marks will be destroyed.

In the case of plastered walls, they should be brushed down and re-washed ; a little ochre may be added to take away the harshness of the white,

but nothing further should be done, and this only under proper direction, or the result may be harmful to the general appearance of the building.

GALLERIES

Retention
of
galleries.

It is unwise to remove galleries even though they be modern, if they are really needed for sitting accommodation ; for enlarging the ground-plan of a mediaeval building is far more harmful to its history and beauty than the retention of galleries which, although in themselves they may be of no architectural value, yet serve a useful purpose ; and it must be remembered that all musicians say that a western gallery is one of the best places, if not the very best place, for an organ.

ORGAN CHAMBERS AND VESTRIES

Organ
chambers
unsuit-
able.

Besides the objection brought forward in the case of galleries to spoiling the plan of an ancient building by additions which can be avoided, experience has shown that on practical grounds there is no more unsuitable place for an organ than an organ-chamber, both in respect of sound and because of the difficulty of keeping the instrument free from damp. The Incorporated Church Building Society does its best to discourage the addition of organ chambers, as will be seen from the following extract from the valuable paper issued by the Society entitled *Architectural Requirements and Suggestions* : The walls

of an old church should not be cut away to make an organ chamber outside.

Where there is no vestry one can, as a rule, be provided by screening off a portion of a church either by curtains or by a plain oak screen simply designed. The space under a western tower almost always makes a good vestry, but in any case, every effort should be made to avoid the erection either of vestries or of organ chambers, both on account of their interference with the plan of a building (a most important historical element) and also because they disturb the structure and are the origin of many settlements.

ADDITIONS TO ANCIENT BUILDINGS

It sometimes, although very seldom, happens that it is absolutely necessary to make a structural addition to an ancient building. In such cases the first consideration must be how the addition can be made with the least damage to the old work. As the ground-plan of a building tells us a great deal of its history, the new part should as far as possible be made obvious by its ground-plan. An effort should of course be made to keep the additions entirely subordinate to the existing building, and to do this all extravagances must be avoided, and the question of colour kept constantly in mind. One of the chief structural difficulties in making additions to the main fabric of an ancient building is due to the tendency of the new work to settle, and either tear itself away from the old work or pull

To be kept quiet and plain.

Risks of settling.

the old work out with it. If first-rate foundations are provided for the new work, and it is carried up slowly, the chances of failure are small; but where there is reason to doubt the quality of the foundations, or the walls must be built quickly, it will generally be wise to cut a chase into the old wall, and build the new work into the chase without bonding, so that it may settle without damaging either the new or the old. If the new foundations have to be carried down to a lower level than the foundations of the ancient work, the old foundations should be underpinned and stepped back till the higher level is reached.

WALL PAINTINGS

Missing
parts.

No attempt should ever be made to replace missing portions of ancient paintings, as the result of so doing will be to lessen the value of what remains. On no consideration will the authorities of the National Gallery allow any picture to be restored, and any picture which has been restored is held to be thereby reduced in value. The same holds good with reference to these paintings. Any effort to preserve such paintings by covering them with anything in the nature of varnish is apt to cause the paintings to be blown off by the gases which the varnish or any similar solution confines in the walls. This has happened in many cases.

Varnish.

Preserva-
tives.

Where the paint is in a powdery state it is necessary that any fixing solution should be applied

WALL PAINTINGS

in the form of a fine spray. Such paintings should be sprayed with a warm and weak solution of size, the operation being repeated until the loose particles of pigment are securely fixed and the ground consolidated. An effective substitute may be prepared with the best pale fresh size, so diluted with spirit as to be quite liquid at 60° Fahrenheit. If the operation can be done without injuring the pigments it is a good plan first to blow away any quite loose dust which may lie on the paintings. This can be managed by the use of bellows. In cases where the walls are perfectly dry and free from soluble saline matters a possible alternative is a preparation composed of pure toluol, ceresin, and Winsor and Newton's picture copal varnish; this is to be applied warm as a spray. This liquid, which ought to be clear, is the nearest approach to a varnish which it is permissible to apply.

The Society has issued a leaflet drafted by Society's Professor Church, F.R.S., giving the proportions of the constituent parts of the solutions and the instruments to be used; and the above notes are only given as an outline of the methods of treatment. On no account should any one be allowed to meddle with wall paintings unless he has had previous experience, or is acting under the direct supervision of some one who has had previous experience.

As to the uncovering of paintings which are hidden by whitewash, this should only be done by

Exposure
of paint-
ings.

some one who is keenly interested in the work. Generally the removal of these coats may be effected by the use of thin round-headed spatulas of bone or ivory, but sometimes it is necessary to employ variously-shaped palette knives of thin steel. The scaling off of whitewash may be occasionally aided by moistening the surface, and even by pasting upon it strips of thin calico, and, when these have dried, carefully peeling them off. Gently tapping the whitewash with a small round-ended mallet will sometimes prove successful where other means fail. If the whitewash is very obstinate it is best to allow it to remain rather than run the risk of removing both whitewash and painting.

FITTINGS

Ancient
fittings.

Where ancient fittings remain they should be retained, and repaired and strengthened where necessary. No attempt should ever be made to replace missing ornamental features. Ancient

Seats.

seats which are found to be inconvenient can, as a rule, be rendered fit for modern requirements with but little alteration. The usual fault complained of is that they are too narrow, and that they are too near together. There is no difficulty in adding to the width of seats, and it is better to take them up and fix them further apart than to abandon them.

Removal
of paint.

It often happens that old oak fittings are covered with paint. This can be removed under

FITTINGS

proper supervision by the application of soda and boiling water, applied with a stiff brush repeatedly. When the worm is attacking oak it is advisable to soak it with paraffin. Worm-eaten oak.

Any new fittings which have to be provided should be of oak and simple in design, and it is better to use chairs instead of benches if oak cannot be afforded for the latter. New fittings. Soft woods are generally best painted; they should never be stained and varnished, or grained and varnished. Hard woods should have nothing done to them. Oil spoils oak, stain is not needed, wax prevents it from gaining its natural beautiful colour, and varnish causes it to decay by keeping the air from it. It must always be borne in mind that no foreign oak is a satisfactory substitute for English-grown oak. Foreign oak grows far too fast to make a durable material, but it is less costly, easier to work, and more easily obtained, so there is a tendency for it to be used if it is allowed.

BELLS AND BELL-CAGES

The bellfounders are apt to have it all their own way with ancient bell-cages and bells. The cages. The old oak cages of our churches are fine pieces of carpentry; and sometimes it is evident that their makers were proud of their work, and ornamented them. One of the characteristics of old cages is their great height. This is a valuable quality, as there is a spring in the height which relieves the tower walls of the strain caused by the swinging of

the bells. Another advantage is that a man can get in under the bells and attend to the clappers.

Repair of cages. It is very seldom justifiable to discard an old bell-cage ; there is no difficulty in replacing the old oak with new where it is defective. Frequently wedges have been driven between the cage and the walls when the cage has worked loose ; but it should have been tightened up and strengthened by iron bolts and straps, for the wedges cause the walls to receive the strain which the cage ought to receive. Undoubtedly more towers have been damaged in this way than by defective foundations or the action of the weather ; so that when a tower is defective the bell-cage is the first thing which should be looked to.

Ancient bells. The mediaeval bells always repay study. The cannons or loops at the crown are well modelled, and the inscriptions round the bells have beautiful lettering and often other ornament, and some have silver coins of the period cast in them. The sixteenth, seventeenth, and eighteenth century bells are also most of them interesting.

Additional bells. Bellfounders not infrequently urge that bells should be added to a peal, when in reality the tower is not large enough to hold them properly. They often remove the ancient oak frame, and put an iron one in its place. There are good authorities who consider that bells never sound so well after this has been done. It is not to be expected that bellfounders should be good masons, so it is very desirable that their proposals should

Iron frames.

BELLS AND BELL-CAGES

have the approval of one who is capable of giving an opinion as to the effect which the carrying out of their recommendations would have on the structure of the tower.

Again, bellfounders often mutilate the bells by Quarter-cutting off the cannons and crown staples in order to quarter-turn the bells. This quarter-turning is often very desirable, as it causes the clapper to strike in a new place, but it can be done satisfactorily without mutilating the bell, and fortunately there are bellhangers who do so, and who value the old oak cages. The Society is always glad to give advice on the question of bells.

DECORATION

It is sometimes thought essential that there should be some sort of decoration in chancels, and the Society thinks in such cases that good draperies simply arranged give the most satisfactory results, and do not damage a building.

MONUMENTS AND BRASSES

Monuments and brasses should be retained in their existing positions, and in cases where it is necessary to remove them while carrying out works of repair, they should be replaced in the same positions as soon as the repairs are finished. It is sometimes necessary to afford some protection to brasses on the floors of churches, as constant traffic is apt to damage them. A sheet of cast lead or a mat placed upon a brass will be found to answer the purpose.

IVY

The question of ivy is a most difficult one to deal with. Where it is actually living on a wall and is not drawing its sustenance from the ground, ivy must obviously be damaging the structure of the wall, and should therefore be killed by being repeatedly cut back close. But any branches which may have inserted themselves in the walls should not be removed, as their removal might cause more harm than the roots themselves. In other cases it is, as a rule, only necessary to keep the ivy cut back, but not so much as to kill it.

IRONWORK

Ancient ironwork should be repaired and strengthened where necessary, and where it has rusted it should be coated with hot paraffin wax, the wax being well worked into the rusted iron.

TIMBER BUILDINGS

No building is so easy to repair as a building of timber construction. It can be jacked up with the greatest ease, its timbers can be scarfed without difficulty, and additional strength can be given in all circumstances by the use of wrought-iron straps, bolts, and fitch-plates. Great care should always be taken not to condemn a piece of timber which appears to be decayed without thorough examination, for as already pointed out (see page 47), the sap wood of oak decays easily, and therefore the surface wood may be decayed when the heart is perfectly sound.

REPAIR OF RUINS

The two chief troubles in repairing ruins are the treatment of ivy and the protection of the tops of the walls. More harm than good may be done by removing ivy where it has obtained a thorough hold of the masonry, for it will often run through the full thickness of the wall. It is generally best to cut the ivy severely back close to the wall and keep it cut back. It will of course look ugly at first but very soon becomes green again. It is always easy to prevent its spreading on to new surfaces and often possible to decrease the space which it covers.

In protecting the tops of walls an effort must be made to do it in such a way as not to be an eyesore. This can be done in most cases by clearing the top of the wall of rubbish, and covering it with a layer of ashes and gas-tar or other water-proof material; this may then be covered with earth and turf, so that the walls may be green at the top, and yet the roots of trees and the like will be unable to penetrate them.

APPENDIX

THE PRINCIPLES OF THE SOCIETY FOR THE PROTECTION OF ANCIENT BUILD- INGS AS SET FORTH UPON ITS FOUND- ATION IN 1877

A Society coming before the public with such a name as that above written must needs explain how and why it proposes to protect those ancient buildings which to most people doubtless seem to have so many and such excellent protectors. This then is the explanation we offer.

No doubt within the last fifty years a new interest, almost like another sense, has arisen in these ancient monuments of art; and they have become the subject of one of the most interesting of studies, and of an enthusiasm, religious, historical, artistic, which is one of the undoubted gains of our time; yet we think that if the present treatment of them be continued our descendants will find them useless for study and chilling to enthusiasm. We think that those last fifty years of knowledge and attention have done more for their destruction than all the foregoing centuries of revolution, violence, and contempt.

For Architecture, long decaying, died out, as a popular art at least, just as the knowledge of mediaeval art was born. So that the civilised world of the nineteenth century has no style of its own amidst its wide knowledge of the styles of other centuries. From this lack and this gain arose in men's minds the strange idea of the restoration of ancient buildings; a strange and most fatal idea, which by its very name implies that it is possible to strip from a building this that and the other part of its history, of its life that is, and then to

stay the hand at some arbitrary point, and leave it still historical, living, and even as it once was.

In early times this kind of forgery was impossible, because knowledge failed the builders, or perhaps because instinct held them back. If repairs were needed, if ambition or piety pricked on to change, that change was of necessity wrought in the unmistakable fashion of the time; a church of the eleventh century might be added to or altered in the twelfth, thirteenth, fourteenth, fifteenth, sixteenth, or even the seventeenth and eighteenth centuries; but every change, whatever history it destroyed, left history in the gap, and was alive with the spirit of the deeds done amidst its fashioning. The result of all this was often a building in which the many changes, though harsh and visible enough, were by their very contrast interesting and instructive and could by no possibility mislead. But those who make the changes wrought in our day under the name of restoration, while professing to bring back a building to the best time of its history, have no guide but each his own individual whim to point out to them what is admirable and what contemptible: while the very nature of their task compels them to destroy something, and to supply the gap by imagining what the earlier builders should or might have done. Moreover, in the course of this double process of destruction and addition the whole surface of the building is necessarily tampered with; so that the appearance of antiquity is taken away from such old parts of the fabric as are left, and there is no laying to rest in the spectator the suspicion of what may have been lost; and in short, a feeble and lifeless forgery is the final result of all the wasted labour.

It is sad to say, that in this manner most of the bigger Minsters, and a vast number of more humble buildings, both in England and on the Continent, have been dealt with by men, of talent often, and worthy of

better employment, but deaf to the claims of poetry and history in the highest sense of the words.

For what is left we plead before our architects themselves, before the official guardians of buildings, and before the public generally, and we pray them to remember how much is gone of the religion, thought and manners of time past, never, by almost universal consent, to be restored; and to consider whether it be possible to restore those buildings, the living spirit of which, it cannot be too often repeated, was an inseparable part of that religion and thought and those past manners. For our part we assure them fearlessly that of all the restorations yet undertaken the worst have meant the reckless stripping a building of some of its most interesting material features; while the best have their exact analogy in the restoration of an old picture, where the partly perished work of the ancient craftsman has been made neat and smooth by the tricky hand of some unoriginal and thoughtless hack of to-day. If, for the rest, it be asked us to specify what kind or amount of art, style, or other interest in a building makes it worth protecting, we answer: Anything which can be looked on as artistic, picturesque, historical, antique, or substantial: any work, in short, over which educated artistic people would think it worth while to argue at all.

It is for all these buildings therefore, of all times and styles, that we plead, and call upon those who have to deal with them, to put protection in the place of restoration, to stave off decay by daily care, to prop a perilous wall or mend a leaky roof by such means as are obviously meant for support or covering and show no pretence of other art, and otherwise to resist all tampering with either the fabric or the ornament of the building as it stands; if it has become inconvenient for its present use, to raise another building rather than alter or enlarge the old one; in fine to treat our ancient

APPENDIX

buildings as monuments of a bygone art, created by bygone manners, that modern art cannot meddle with without destroying.

Thus, and thus only, shall we escape the reproach of our learning being turned into a snare to us; thus, and thus only, can we protect our ancient buildings, and hand them down instructive and venerable to those that come after us.

The Offices of the Society are : 10 Buckingham Street, Strand, London, W.C. Those who agree with its principles as here set forth, and are willing to become members, are requested to communicate with the Secretary at the above address.

Edinburgh: Printed by T. and A. CONSTABLE

u. c

175

Central Archaeological Library,
NEW DELHI.

20020

Call No. 913.09/S.P.A.B.

Author— S.P. A.B.

Title— Notes on the repair of
ancient buildings

Borrower No.

Date of Issue

Date of Return

"A book that is shut is but a block"

CENTRAL ARCHAEOLOGICAL LIBRARY
GOVT. OF INDIA
Department of Archaeology
NEW DELHI.

Please help us to keep the
clean and moving.

S. N. 148. N. DELHI.